

Natural Resources Conservation Service
Technical Forestry Note TX-FS-12-5

**FOREST STAND
IMPROVEMENT**



Forest Stand Improvement is an effective practice to improve wood quality, forest health, aesthetics, and wildlife habitat. Trees are typically removed by cutting, dozing, injection, mowing, chopping, spraying or prescribed burning. More details found in the text...

The purpose of forest stand improvement is to improve the forest by adjusting the number of trees per acre and/or the understory vegetation. There are many goals or objectives that can be met by conducting a forest stand improvement such as increasing the quality of forest products, improving the health of the forest, reducing the risk of insects, disease and wildfire, improving wildlife habitat, initiating regeneration of desired trees and converting a forest to a silvopasture to mention a few. A forest is a dynamic system that is constantly undergoing some form of change even though the changes are not visible to the casual observer. Trees regenerate in the thousands and over time this number decreases down to a few hundred in a mature stand.

Forest stand improvement practices mimic the natural processes of reducing stand density or the number of trees growing per acre. On a given acre, there is only a finite amount of water and nutrients available for trees and plants to extract for their use. If the number of trees and understory vegetation is controlled, the remaining trees and vegetation have more water and nutrients available for their use. The remaining vegetation is healthier and more vigorous which means they have a higher capacity to withstand drought, insects, diseases, and wildfires. After the trees adjust to the improvement practices, they are more likely to withstand ice damage and other forms of natural hazards.

Look at these photographs, they are taken in the same pine stand that had a forest stand improvement practice done when the stand was 10 years old. The pine stand was thinned to several residual



densities of trees. The stand at age 10 had over 2000 trees per acre and it was thinned using a dozer and a rolling drum chopper. These photos were taken at age 20. The top left received no pre-commercial thinning. Note the small diameters of the trees and minimal understory vegetation (average diameter is 4.2"). The top right had a single pass rolling chop (Single chop – average diameter is 5.6"). Lower left had the chopping plus 6 feet of space between residual trees (Chop + thin – average diameter is 6.7"). Lower right received the chopping plus 10 feet of space between residual trees (Double thin – average diameter is 8.4"). The double chop actually had some trees reaching sawtimber size by age 20 and this treatment removed the greatest number of trees when the stand was 10 years old. The measurements revealed that the forest stand improvement that removed the most trees had the largest gain in diameter growth.

This stand has gone through an ice storm after the forest stand improvement. Note that the portions of the stand that were thinned are still upright with little damage and the part of the stand that was not thinned has numerous trees bent over. So in this stand, forest stand improvement increased usable wood products, increase wildlife foods and the thinned portions of the stand withstood the ice storm better than portions left unthinned.

How Is Forest Stand Improvement Accomplished?

There are many practices that can be used to conduct a forest stand improvement. Here are a few methods that have been used as a forest stand improvement practice.

HERBACEOUS WEED CONTROL: Herbicides are used to curb growth of weeds and grass the first year after planting to increase survival and growth of seedlings. This treatment may be applied the second year following planting in some stands if needed. Herbicides can be applied in a band sprayed over the seedlings, directed at the base of the seedlings, in a spot around specific seedlings or broadcast over the entire planted area. Disking can also be done between rows of trees to reduce herbaceous vegetation and

small woody shrubs. The distance between the rows of trees has to be wide enough to accommodate the tractor and disk.

PINE RELEASE: Herbicides are applied to older (2+ year-old) pine stands to control certain vines, woody shrubs and hardwood trees. Selective herbicides may be applied broadcast over the entire area, shrubs or trees can be treated individually by directed sprays, basal sprays, or injected to remove the shrub or trees from the site. Generally a chemical operation, but some mechanical methods could be used to reduce completion around desirable trees.

HARDWOOD RELEASE: Competing trees or shrubs can be controlled by direct sprays, basal treatments or single tree injection. Broadcast spraying is not recommended in hardwood stands. Herbicides should only be applied to the tree or shrub targeted for removal from the stand. Generally a chemical operation, but some mechanical methods could be used to reduce completion around desirable trees.

PRESCRIBED BURNING: Prescribed burning is a controlled fire applied in a skillful manner under exacting conditions to a specific area for a definite forest management objective. Prescribed burning eliminates wildfire fuels, prepares sites for tree planting, improves visibility for recreation, increases growth of many flowering annuals and other plants, improves habitat of many fire dependent species including the gopher tortoise, indigo snake and red-cockaded woodpecker, and much more.

PRECOMMERCIAL THINNING: Precommercial thinning releases crowded pine stands to prevent stagnation and increase growth on remaining trees. It produces no immediate income for the landowner, but the cost is justified by the increased value of future growth. Thinning can be done by hand, using chainsaws, brush-hooks, axes or mechanical equipment, such as heavy-duty bush-hogs, rolling drum choppers or other mechanical thinning systems.

PRUNING: Pruning of pine increases the amount of wood free of knots and other blemishes in the first 16 feet of the tree, thereby increasing the quality of the wood and the market value of the tree. Pruning can also be used to improve aesthetics and to improve equipment access.

MECHANICAL METHODS: There are numerous mechanical methods that can be used for forest stand improvement.

Chainsaws can be used to cut down individual trees and shrubs. While this method is time consuming, it can be done a little at a time and on small acreages.

Heavy duty bush hogs can be used to cut small diameter trees (1-2" dbh) and understory shrubs.

Tree cutters can be used to cut trees up to 6" dbh and understory shrubs. This cutter requires a tractor good horsepower to operate properly. Some other tractor mounted devices to remove trees or shrubs include the Seppi M Brush-Cutter, Bull Hog Wood Shredders, Brown Tree-Cutter, Timberwolf DF Brush-Cutter, and numerous other brands. The main idea is that there are cutting attachments for a variety of tractors, skidders and dozers that cut, shred, or mulch trees and shrubs that operate very efficiently.

Dozers can be used to sever trees if they are equipped with a cutting blade or they can simply push the tree or shrubs out of the ground.

The prime concern with mechanical operations is that the remaining trees are protected and not damaged by the equipment. The residual trees are the trees selected to provide the benefits identified by the landowner and that are being left on the site.

The first step in conducting forest stand improvement is talking with the landowner about their goals for the property. They might have multiple goals such as improve timber quality and wildlife habitat.

The second step is to gather some inventory information regarding the types of trees on the property (species), approximate age of the primary trees, density (basal area or trees per acre), live crown ratio of pine trees present on the site, wildlife trees or shrubs, and understory vegetation.

The third step is to determine the number of trees to leave per acre. Basal area measurements can be used instead of trees per acre. The total tree per acre minus the trees per acre to leave will provide an estimate of the number of trees per acre that need to be removed. For example: A 1/10th acre plot can be measured and every tree that is within the plot boundary can have a ribbon tied around it. In our example, there are 13 trees with ribbons on them in the plot. The 13 trees is equivalent to 130 trees per acre and we have determined that the trees are over 30 years old. We only need to remove 2 to 4 trees on this plot but that equates to 20 to 40 trees per acre. The trees selected for removal should include less desirable tree species, trees with disease, forked trees, trees with poor form, or trees with the top or major limbs broken off. Generally, in most stands there will be more than enough trees in the removal category to reduce the number of trees per acre. If more trees are needed to reach the targeted trees per acre, move to diameters, desirable species and spacing between trees are the second level of selection. (Take multiple plots before setting the trees per acre to remove)

Fourth, select the method for reducing the trees per acre such as mechanical tree cutter or chemical by injection, etc. The method chosen often depends upon what is available in the area to do the task of reducing the trees per acre.

Fifth, inspect the operation once it is underway to see if the targeted stand of trees per acre is being achieved. Adjustments can be made early in the operation saving time and money for the landowner. Also, check the residual trees to make sure that they are being protected and not damaged by the forest stand improvement operation.

Forest Stand Improvement is an effective practice to improve wood quality, forest health, aesthetics, and wildlife habitat. This forest practice is not used very often due to the costs and often without immediate returns. However, many studies have shown that the improvement in tree growth in both size and quality do make this a financially viable management tool. Below are some photographs of before and after treatments conducted under a forest stand improvement practice. Do not hesitate to call your zone or state forester if you have questions regarding forest stand improvement. Texas Forest Service foresters may also be of assistance in deciding upon a forest stand improvement operation.

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Pine stand before FSI.



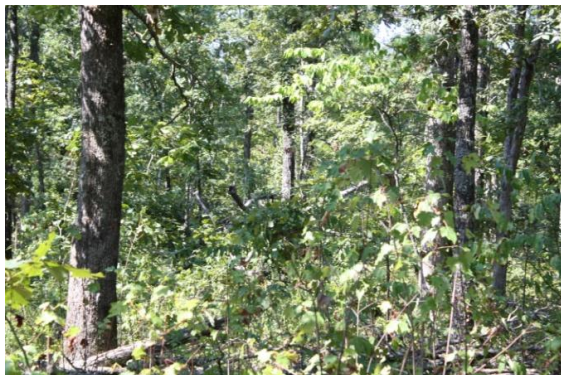
The same pine stand after FSI with a Brush Cutter .



Young pine stand without vegetation control.



The same pine stand with chemical vegetation control.



A hardwood stand before FSI.



The same hardwood stand after FSI done with a chainsaw and debris piled with a dozer.